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## Article

# The Acceleration of Urban Sustainability Transitions: A Comparison of Brighton, Budapest, Dresden, Genk, and Stockholm

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**Abstract:** City-regions as sites of sustainability transitions have remained under-explored so far. With our comparative analysis of five diverse European city-regions, we offer new insights on contemporary sustainability transitions at the urban level. In a similar vein, the pre-development and the take-off phase of sustainability transitions have been studied in depth while the acceleration phase remains a research gap. We address this research gap by exploring how transitions can move beyond the seeding of alternative experiments and the activation of civil society initiatives. This raises the question of what commonalities and differences can be found between urban sustainability transitions. In our explorative study, we employ a newly developed framework of the acceleration mechanisms of sustainability transitions. We offer new insights on the multi-phase model of sustainability transitions. Our findings illustrate that there are no clear demarcations between the phases of transitions. From the perspective of city-regions, we rather found dynamics of acceleration, deceleration, and stagnation to unfold in parallel. We observed several transitions—transitions towards both sustainability and un-sustainability—to co-evolve. This suggests that the politics of persistence—the inertia and path dependencies of un-sustainability—should be considered in the study of urban sustainability transitions.

**Keywords:** urban sustainability transitions; acceleration; comparative case study; European city-regions; upscaling

## 1. Introduction

With our future becoming predominantly urban, there are many sustainability-oriented innovations that are evidenced in cities. We empirically observe that in cities actor collectives actively pursue and trial sustainability and provide new evidence grounds for solutions. Such sustainability

innovations vary from organic urban food production, to the upcycling of household products, reusing waste as a resource, climate neutral transport, product sharing and sufficiency-oriented lifestyles. These initiatives start to create new social networks and synergies, develop new narratives on the future of cities and become relevant actors in urban governance arenas [1,2]. These are dynamics that seem to differ from the earlier phases of sustainability transitions, which are focused on nurturing innovations in protected spaces. This raises the question if and how urban societies already move beyond the seeding of alternative experiments and the activation of community initiatives for sustainability action. It is, therefore, important to examine local agents of change such as community initiatives and learn how sustainability in practice is further diffused and integrated into the life of cities [3,4]. So far, there is a limited understanding of the processes through which the innovations introduced by such transition initiatives (henceforth TIs) are taken up or transferred beyond the community that created, facilitated, and nurtured them.

Our research addresses this theoretical gap and offers a new perspective on the understanding of the context-led and agency-led conditions that enable or hinder the acceleration of sustainability transition in city-regions. We do so based on in-depth empirical case studies and a cross-case comparative analysis of five European city-regions. In comparing the acceleration of sustainability transitions in five city-regions, we explore the following research questions:

1. What are the conditions that enable and hinder the acceleration of sustainability transitions in cities from the perspective of local transition initiatives?
2. What are the commonalities and differences between the dynamics in which the acceleration mechanisms unfold in the city-regions?

In order to investigate these questions, we employ a newly developed conceptual framework of acceleration mechanisms of sustainability transitions that has been presented in [5–8]. In the next section, we give a brief overview of the literature on the acceleration of sustainability transitions and the acceleration mechanisms. In the methodology section, we introduce the design of the comparative case study. We then present the empirical findings on the dynamics of acceleration in the city-regions and the acceleration mechanisms. Finally, we discuss the theoretical implications of our research and point to questions for future research.

## 2. Theory

A sustainability transition is a “radical transformation towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies” [9] (p. 1). As such it brings about fundamental change in the ways of doing (practices), ways of thinking (cultures) and ways of organizing (structures) (hereinafter referred to as DTO) that unfold in phases with different distinct dynamics [10]. The phases that have been identified in the transitions literature include the predevelopment, the take-off, the acceleration and the stabilization [11,12].

In sustainability transitions studies, the predevelopment and take-off phases have been studied extensively [13,14] while the acceleration phase has remained under-explored. Therefore, it is the focus of our comparative study of urban sustainability transitions. We define acceleration as the accumulation of changes in low-carbon domains and the activation of TIs that are creating new connections via their novel ways of doing (practices), thinking (narratives, imaginaries) and organizing (structure) and that “normalize” and anchor sustainability in their urban communities.

In the following, we will discuss five acceleration mechanisms and elaborate on them on the basis of an extensive literature review (for a detailed account of a conceptual framework on acceleration see [5,6,8]).

Upscaling is the growth of members, supporters, or users of a single transition initiative to spread new ways of thinking, organizing, and practicing. Upscaling has been identified as a meaningful scaling process for diffusion of impact and outreach of “product or practice from Tis” [15–17]. Fisher et al. [3] (p. 35) also point at the increase in the number of members that “contribute time, effort and

expertise” that also shows professionalization of a civil society initiative as an important development of bottom-up action.

Replicating is the take-up of new ways of DTO of one transition initiative by another transition initiative or different actors to spread these alternative ways. Replicating is recognized as a process that changes the pace of change in diffusing and spreading innovative practices through interested and supportive actor-networks [15,18]. Garcia et al. [19] recognizes replication of innovative practices as a process that contributes to systemic change, further backing our conceptualization as a process for changing the pace of change in transitions.

Partnering is the pooling and/or complementing of resources, competences, and capacities of local TIs to exploit synergies to support and ensure the continuity of the new ways of doing, organizing, and thinking. Partnering describes the ways TIs seek synergies and leverage resources [2,19–25] that also allows collective learning [26–29].

Instrumentalizing is tapping into and capitalizing on opportunities provided by the multi-level governance context of the city-region to obtain resources. Instrumentalizing is about capitalizing on opportunities and relies on the openness to change and transparent governance situations for taking place [1,30–32] and refers to moving from mission to action for sustainability transitions [1,28,33,34]. Healey [2] also recognizes the need to acquire resources to enable the provision of services and to fund the initiative’s center and staff/founders. Next to these, Fraser and Kick [34] point to the ability of community initiatives to source resources as an essential way to revitalize urban neighborhoods and regenerate deprived areas.

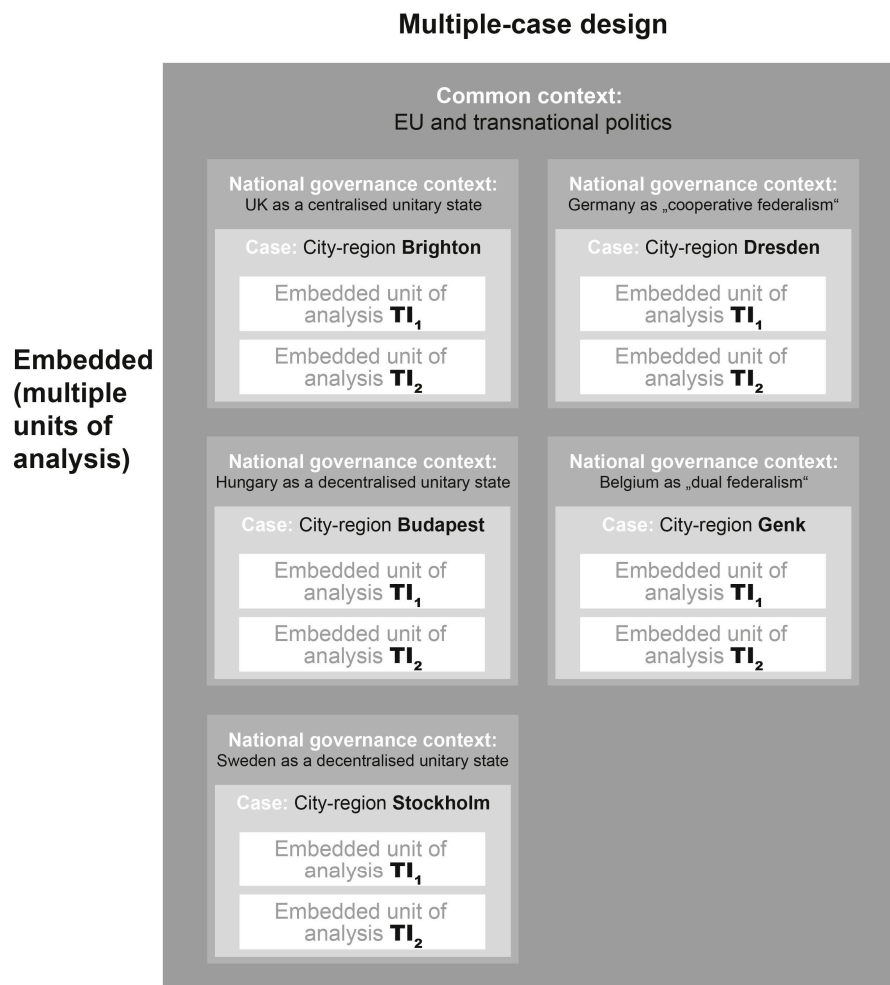
Embedding is the alignment of old and new ways of doing, organizing, and thinking to integrate them into city-regional governance patterns. Embedding captures the connecting of issues and solutions to institutions as a way to spread and formalize new ways of doing, thinking, and organizing [15,19,24,35–38] and the extent to which local TIs strategically shape local governance dynamics [1,18,39].

These mechanisms operate not only separately, but can also reinforce each other to accelerate urban sustainability transitions. The proposed acceleration mechanisms are to be tested, validated, and improved through the comparison of the dynamics of sustainability transitions in five diverse city-regions.

### 3. Methodology

We adopted an explorative, qualitative approach to analyze a poorly understood phenomenon [40]. In comparing the city-regions, we applied an “embedded multiple-case design” with the city-regions as the cases and local TIs as the embedded unit of analysis [41]. Both the cases (the city-regions) and the embedded units of analysis (the local TIs) are embedded in a multi-level governance context. This research design seems especially appropriate, because the patterns at the level of the entire case (here the city-region) are constituted by and can be studied through the dynamics of the single units within this case (here the TIs). Figure 1 depicts this case study design.

Based on this research design, the research process consisted of the following steps: the selection of the cases (the city-regions), the selection of the embedded units of analysis (the TIs), the in-depth study of the TIs within the city-regions and the comparison of the city-regions.



**Figure 1.** The “embedded multiple case design”.

### 3.1. The Selection of the City-Regions

We aimed to study the dynamics of urban sustainability transitions in a diverse range of city-regions to test and refine our theoretical propositions on the acceleration of urban sustainability transitions. Thus, while the city-regions share a common context—constituted by EU and transnational politics—they differ in their national contexts and local governance patterns. By comparing these diverse local settings, we intended to identify the commonalities and differences among the city-regions. One important precondition for selection was the existence of a sufficient number of TIs in the city-regions, which would provide a sound basis for gaining empirical data. This was ensured by desktop research on local TIs before entering the field. As this criterion was fulfilled by different city-regions in each country, we chose those city-regions where research teams had privileged access to information due to existing networks, contacts and trustful relationships with key informants and local public, private and civil society actors. The profile of each city-region is sketched in the following.

#### 3.1.1. Brighton and Hove (UK)

The city of Brighton and Hove—henceforth Brighton—is located in the south east of England with a population of approximately 275,000 [42]. A number of persistent local pressures are forcing the city to redevelop along more sustainable lines, to become “a resource-efficient, One Planet, Zero Carbon City” [43] (p. 19). These pressures include: a growing population combined with a high population density, limited affordable housing and long-term inequalities between city residents and

neighborhoods as well as poor air and ground water quality. Nonetheless and against this backdrop, Brighton is a frontrunner in the UK for its political commitment to sustainability. Between 2011 and 2015 the city was home to the first Green-led local authority in the country. Since 2010, Brighton has also been home to a national Green Member of Parliament. In 2013, the city became the world's first designated "One Planet Living City" (a designation that recognized the city's commitment to living well within an equitable share of the earth's resources). In 2014, the wider city-region became the world's first UNESCO Biosphere Reserve (each reserve being dedicated as learning sites for sustainable development) to encompass a large urban area. Local TIs have helped to create this political commitment and flourished under it.

### 3.1.2. Budapest (Hungary)

Among the city-regions studied, Budapest with about 1.7 million inhabitants represents the only city within a post-socialist state, in a more recently admitted EU member state. The surrounding structural conditions for civic organizations and the overall mindset of the society they are operating within are impacted by the not-so-distant, and still-transforming, regime change of the late 1980s and early 1990s. Society at large exists with vivid memories of pre-regime change governance and economy, and the conflicted relationship with the often promised benefits associated with accelerated transition.

While environmental issues in Hungary have generally grown in importance since the socialist regime change, this has been within a generally unpredictable governance context. Since EU accession in 2004, several policy and regulatory changes have been achieved to comply with EU environmental legislations, linked to funding and strategic development programs. However, environmental and sustainability issues have never been sufficiently mainstreamed, and restructuring within national governance has further limited their representation in public policy in favor of economic growth.

The functioning of community initiatives in Hungary is largely a factor of funding availability. The most funding for environment and sustainability issues comes from abroad, in particular the EU funds and the Norway Grants scheme. National funding sources are also available, although those awarded from the government are highly influenced by political orientation. This uncertainty and long-term unpredictability of funding sources imply that TIs operate at a structural disadvantage. The absence of an efficient model for collaborating with political decision makers has also resulted in a lack of trust between TIs and public authorities in their community. Hence, community initiatives continue to be marginal actors with limited influence.

### 3.1.3. Dresden (Germany)

The city of Dresden has a population of approximately 544,000 citizens [44] and is located in Saxony, one of the 16 German federal states. Being under the communist regime of the former German Democratic Republic (GDR), Dresden experienced the transition towards democracy and market economy fairly recently in 1989/90. This makes it particularly interesting to study the development dynamics of a civil society, who regained the freedom to participate and voice alternative views just 25 years ago. This gave rise to two generations of TIs. The first generation formed after the Reunification of Germany and therefore has strong connections with the environmental and peace movements of the GDR. The second generation emerged since the early 2000s and is more explicitly linked to the concept of sustainable development.

As these TIs had to develop in the more conservative political environment of the City of Dresden and the Land of Saxony, many of them originated from bottom-up processes. The City of Dresden joined the transnational network ICLEI in 1992 and the Climate Alliance in 1994. These include a commitment to sustainable development. While this is reflected in several urban development programs of the City of Dresden [45], the criticism remains that a gap exists between the formulation of these principles and their implementation [46]. Local elections in 2014 led to a change in government from a conservative-liberal towards a left-wing government. This opened a window of opportunity for alternative policy concepts, which needs to be examined in the future.



### 3.1.4. Genk (Belgium)

The city of Genk has 65,000 inhabitants and is located in the Eastern part of Flanders (Belgium) [47]. Over the last 100 years, Genk's history has been shaped by coal mining, which led to a rapid period of migration and industrialization [48]. This shaped the socio-economic fabric of Genk by attracting more industries and giving it a strong working-class background and a diverse population. Genk shares the characteristics of European post-industrial cities that have gone through economic restructuring and are searching for a new identity [49].

It has an extraordinary history of experimentation on social innovation. Moreover, since the recent economic downturn, Genk is actively exploring new economic notions (e.g., cleantech, circular economy, smart city) to regenerate a more resilient local economy. City planning programs emphasize among others a “meaningful city”, making Genk a “laboratory city” for developing sustainable solutions, and an “ecological city” [50]. City leaders recognized that conventional ways of DTO are insufficient to pave the way for a structural transformation and began to explore ways of increasing their transformative capacity. The government spent 8.5% of the city budget in 2015 to promote institutional innovation, for instance new ways of cross-departmental collaboration or citizen empowerment. This is the more remarkable as the austerity measures of Flanders leave cities to do more with fewer resources. The history of cultural segregation triggered the development of a district management team and a district budget to promote bottom-up activities. Genk also houses an active scene of community development professionals (Stebo, Rimo). The strongpoint of both teams is that they are embedded in the local communities and work as connectors.

### 3.1.5. Stockholm (Sweden)

The city-region of Stockholm consists of 26 municipalities, including the capital of Sweden, Stockholm. The population of 2.1 million inhabitants is increasing with 30,000–40,000 each year resulting in high demands for urban development. The municipalities share many characteristics: the physical landscape, the overall urban drivers, technical infrastructure, economy in a broad sense, and the national governance context. However, they also differ from each other in area, demography, finances, political majority, and priorities reflected in their urban development strategies. The governance of Stockholm is highly decentralized with strong municipalities. These have a land use planning monopoly, whereby the regional actors have a guiding role that is executed through a regional development planning process. This decentralization is intended to provide grounds for broad public participation, supporting contextualized decisions that fit the local conditions. This potentially provides a source of diversity in approaches to sustainability challenges, however also putting high demands on co-ordination between the local municipalities when addressing larger scale environmental issues such as climate change adaptation, water security, nature conservation and transportation.

Stockholm has a reputation of being at the forefront of environmental sustainability. Nonetheless, critics suggest that even if Stockholm is performing well in some regards, the pace of change to sustainability is slow. An important engine in the Swedish sustainability work is the participation of well-established NGOs, where there is a strong legacy of public engagement in local public associations. Presently, Sweden (and Stockholm) is in a phase where the traditional forms of public engagement are challenged by new forms of organizing, mobilizing and engaging citizens with unknown outcomes for transformative action.

Within these city-regions, TIs were selected for an in-depth analysis of their activities and the transition dynamics that follow from these activities in the city-regions.

## 3.2. The Selection of the TIs

We define TIs as collective agents who aim to drive transformative change towards environmental sustainability with their locally-based activities, i.e., the enactment of sustainable ways of DTO [10]. With locally-based, we mean that the initiative is driven by people that live or work in the city-region,

and the activities of the initiative directly aim to change approaches, routines, practices and/or infrastructures within the city-regions. With environmental sustainability, we refer to those initiatives striving for environmental sustainability as a core normative objective of their activities.

First, an inventory of approximately 100 locally-based, civil society, business and government-led TIs was compiled in each city-region [51]. From this inventory, some TIs were selected to be studied in depth. The selection criteria meant to ensure that the selected TIs

- cover all relevant empirical domains (food, mobility, resource management, education, energy, nature conservation, built environment)
- cover TIs led by different actor types (e.g., civil society-led, public sector-led, private sector-led)
- are innovative in their local setting
- represent TIs that are well-established as well as those that are fairly new and still developing connections.

### 3.3. The In-Depth Study of TIs within the City-Regions

Following a synchronic comparison, the diverse city-regions were compared at the same point in time (2014–2016). The empirical data were gathered through a systematic literature review, extensive documentary analysis and desk research on the local governance patterns and the TIs, the attendance of local events, as well as semi-structured interviews in all city-regions. Interviews were conducted with insiders and outsiders of selected TIs, as well as with so-called helicopter viewers. The latter provided a bird's eye perspective on the city-region and developments towards (un-)sustainability therein. While they are knowledgeable about local governance patterns and the development of TIs, they do not belong to any specific initiative. They are usually public officials or politicians, scientists, local business actors or journalists who can provide an external perspective on the TIs. Insiders and outsiders of TIs were interviewed to gain a more balanced understanding of the activities of the TIs. While insiders belong to the core of an initiative (e.g., founding members), outsiders know about the initiative (e.g., users of a repair workshop), but are not actively involved in running the initiative. In all city-regions, we interviewed people from different sectors, namely the public sector, the private sector and/or civil society. In the case of Budapest, we could barely identify TIs driven by the public or the private sector, while we found a comparable number of community-based TIs (see Table 1). The majority of interviews were face-to-face interviews, while a few were conducted via phone or Skype. These interviews were complemented by workshops with all interviewees to discuss, validate and enrich our empirical findings.

**Table 1.** An overview of the interviews conducted in the four city-regions.

City-Region	Interviews in Total	Interviews with TIs	Interviews with Helicopter Viewers	Interviewees according to Sector	Workshops
Brighton	33	23	10	Civic (20) Public (10) Private (3)	5
Budapest	12	12	0	Civic (10) Public (0) Private (2)	2
Dresden	27	19	8	Civic (9) Public (9) Private (9)	3
Genk	23	10	13	Civic (11) Public (9) Private (3)	5
Stockholm	18	14	4	Civic (9) Public (5) Private (4)	6



For our analyses, we recorded, transcribed and coded the interviews [52]. Our coding scheme included categories for the acceleration mechanisms upscaling, replicating, partnering, instrumentalizing and embedding, as well as the local governance patterns within the city-regions. Examining the empirical data, we foregrounded the obstacles and opportunities that arise from the varying settings within the city-regions. The field work including the interviews was conducted by five local research teams that were-based in the respective countries. The interviews were conducted in the local languages to avoid missing or misunderstood information in the empirical data due to insufficient knowledge of foreign languages. In order to ensure the quality and comparability of our case studies, we jointly elaborated an application guide that outlined each and every step of the process of data collection and analysis. This was done through the cooperation in workshops, skype meetings and the circulation of documents. In so doing, we tried to ensure the same understanding of key words and concepts across countries, languages, cultures, and disciplinary backgrounds of the participating researchers.

#### 4. The Acceleration Mechanisms

##### 4.1. Upscaling

###### (a) Commonalities

Upscaling as the growth of members, supporters and users of single TIs was a commonly observed phenomenon across the city-regions (see Table 2). In their development process, many TIs have experienced phases of both upscaling and downscaling.

The motivation for upscaling varied between the TIs. While for some TIs upscaling was a deliberate mission, for others, it was an unintended effect that resulted from the visibility and impact they have created. However, TIs developed a critical attitude towards upscaling because they experienced a tension between the management of quantity and the management of quality. Accordingly, a growth in quantitative size might undermine the core values of a TI, pointing to the limits of growth. Growth requires TIs to professionalize by creating an internal hierarchy and/or delegating functions within the initiative. By remaining small, TIs seek to avoid the problems of typical hierarchical structures that are poorly adapted to increasing dynamics of change. They rather seek to pioneer new models of self-organization (e.g., following the example of nodes in a network structure without central control) that are smaller, leaner, and more flexible. These enable them to be more adaptive, locally attuned and, thus, resilient, in an increasingly volatile world. Smaller structures enable them to retain the closeness and creativity that are essential to driving transformative change. In light of these challenges, several TIs valued smallness and opted for replicating as an alternative to upscaling.

The capacity of a TI to upscale is closely related to the availability of financial resources and, thus, to a TI's model of financing. For some TIs, the co-benefits they deliver are of an exclusive character. These TIs can establish self-sustaining financial models, for instance by charging membership fees or prices for the goods and services they provide. Yet, for others, the co-benefits they create have the character of public goods, where no one can be barred from access. Therefore, they rely on external funding and are more vulnerable to changes in the governance settings, including urban governance patterns, multi-level governance contexts and partnerships.

The upscaling and continued existence of TIs often relied on a few individual enthusiasts who acted as mediators, networkers, and translators between different actors. A withdrawal of these mediators, networkers and translators often causes a TI to lose its drive, to change direction in unwelcome ways or to cease to exist entirely. This makes TIs quite fragile and vulnerable.

The upscaling of TIs induced positive spillover effects that inspired wider change in society. It also increased the visibility and recognition of TIs by (local) political actors. By doing so, upscaling might influence political agenda setting and ultimately contribute to embedding.

## (b) Differences

However, the dynamics of upscaling also differed between the city-regions (see Table 2). These differences reflected different urban governance patterns and/or governance contexts of the city-regions.

In context of the centralized unitary state of the UK, the central government holds the “power of the purse”, having the authority to decide over the allocation of financial resources. In the wake of austerity politics, public spending cuts considerably constrained the resources available to TIs in Brighton and, as a consequence, the upscaling of TIs.

In Budapest, TIs reported difficulties in upscaling due to a lack of resources and support by governmental authorities from both the central government and the local government. Therefore, the TIs struggled to professionalize and attract new members, users, and supporters.

In the city-region of Dresden, TIs criticized the conservativeness and insufficient political support by previous City Councils. This constrains the possibilities of upscaling for TIs. Moreover, the overall number of people engaging in TIs in the city-region of Dresden is stagnating. Many individuals hold multiple memberships in TIs. This implies that a higher number of TIs does not translate into a higher number of people involved in these TIs. Therefore, the sustainability scene in Dresden appears to be fragile and vulnerable. In this setting, the upscaling of one TI also gave rise to tendencies of exclusion, where the upscaling of one TI prevented the upscaling of other TIs.

In contrast to the other city-regions, the local government of Genk was open to change and mobilized time, money and people to promote sustainability [6]. In doing so, it could build on a tradition of pioneering social innovation in the city-region of Genk. This tradition gave rise to a well-organized network of district managers and district budgets. They substantially supported bottom-up activities of shared value creation in the local communities. In addition, community workers have played an essential role in fostering the development of TIs. This governmental support helped in the upscaling of individual TIs.

Quite distinct from the other city-regions, the governance patterns within the city-region of Stockholm are characterized by a pronounced multi-levelness. This is related to the decentralized unitary state of Sweden that grants considerable local autonomy to the 26 municipalities within the city-region of Stockholm [53]. Therefore, the conditions for TIs vary between the 26 municipalities with some supporting the upscaling of TIs and others neglecting them.

These differences between the city-regions illustrate how urban governance patterns and governance contexts shape the chances and challenges for local TIs. Political backing, providing time, people, and resources, is not a necessary condition for the upscaling of local TIs. Empirical findings indicate that TIs could extend their membership even if such endorsement was lacking. However, it can provide substantial support for bottom-up activities.

Table 2. Upscaling [54].

Growth in Members, Users and Supporters
Commonalities
Finding:
The tension between the management of quantity and the management of quality
Examples:
Brighton:
<ul style="list-style-type: none"> <li>Hanover Action for Sustainable Living: The TI decided against upscaling by introducing the position of a paid employee because this would contradict the principle of voluntarism.</li> </ul>

Table 2. Cont.

Growth in Members, Users and Supporters				
<b>Commonalities</b>				
Finding: The link between the model of financing and the ability to upscale				
Examples: Dresden:				
<ul style="list-style-type: none"> <li>Organic food cooperative (VG) and Aha: The difference in funding schemes is exemplified by an organic food cooperative (VG) and a sustainable education TI (Aha). While the resource base of the former grows with the expansion of members due to membership fees, it does not for the latter. Without membership fees, an increase in the activities of Aha does not translate into an increase in its resources. It rather depends entirely on external funding and this limits its ability to upscale.</li> </ul>				
Finding: The importance of individuals acting as mediators, networkers and translators				
Examples: Budapest:				
<ul style="list-style-type: none"> <li>Transition Wekerle Movement: Within the Transition Wekerle Movement, participants have become accustomed to the ebb and flow of their own capacity and reach based on a rotating size of its participant base, with constant guidance offered by a smaller core group of members.</li> </ul>				
Finding: Upscaling and increased visibility and recognition of the TIs				
Examples: Budapest:				
<ul style="list-style-type: none"> <li>Hungarian Cyclists Association: An increase in the visibility of bicycle culture through group riding events and an annual “Critical Mass” organized by the Hungarian Cyclists Association has brought bicycle mobility to the forefront of urban transport discussions in Budapest.</li> </ul>				
<b>Differences</b>				
<b>Brighton</b>	<b>Budapest</b>	<b>Dresden</b>	<b>Genk</b>	<b>Stockholm</b>
The austerity politics of a powerful central government undermining the efforts of TIs to scale up.	Due to a lack of support by governmental authorities—both central government and local government—TIs struggled to scale up.	The conservativeness of previous City Councils constrained the possibilities of TIs to scale up.	A pro-active local government, promoting change towards sustainability, and a tradition of social innovation helped in the upscaling of TIs.	Due to the decentralized unitary state, multi-levelness and varying conditions between the 26 municipalities within the city-region of Stockholm.

## 4.2. Replicating

### (a) Commonalities

While TIs have been replicated extensively across city-regions, they have been much less so within the city-regions (see Table 3). All forms of replicating were based on some form of contextualization, because they needed to be adapted to urban governance conditions to be implemented successfully. This contextualization occurred to stronger or lesser extents. It ranged from strong emulation (i.e., ideas were contextualized and adapted to local conditions so that a bricolage of different elements emerged) to mere inspiration, where other TIs served as a rather loose source of inspiration for new ones.

Replicating was spurred through mediators, networkers, and translators because they were the most well-connected to networks spanning across city-regions and/or governance levels, the most curious and the most enthusiastic to bring new ideas to the city-regions.

Replicating proved to be a vital source of inspiration for local TIs. It supported the local diversification of transformative practices and facilitated learning because it enabled TIs to draw

on the experiences of other TIs, entailing both positive and negative lessons. Therefore, they did not need to “re-invent the wheel” and replicating, especially from outside the city-region, has become crucial for accelerating urban sustainability transitions.

We could not identify significant differences on replicating across the studied city-regions.

**Table 3.** Replicating.

The Take up of New Ways of DTO of One TI by Another TI	
<b>Commonalities</b>	
Finding:	
Little replicating of TIs within the city-regions	
Examples:	
Budapest:	
	<ul style="list-style-type: none"> <li>• Szatyor Association: As a local food cooperative, the Szatyor Association has helped spawn a number of similar direct marketing initiatives in the city and across Hungary by participating in skill building workshops and informative sessions with interested community groups.</li> </ul>
Finding:	
Replicating as emulation and bricolage or mere inspiration	
Examples: Stockholm:	
	<ul style="list-style-type: none"> <li>• Sustainable Hökarängen: It argues that “even if the experiences are now transmitted to Bagarmossen and Årsta city-districts, there is a need for careful contextualization in order to be successful.” (Interview ST HH).</li> </ul>
Finding:	
Mediators, networkers and translators bringing new ideas to the city-region	
Examples:	
Dresden:	
	<ul style="list-style-type: none"> <li>• Transition Town Dresden: The establishment of Transition Town Dresden as a networking initiative has facilitated replicating because it has provided a platform for sharing knowledge and experience and for introducing change agents to other initiatives.</li> </ul>

### 4.3. Partnering

#### (a) Commonalities

Partnering has occurred in quite diverse constellations: between TIs within the city-region, between TIs of different leadership type (community-led, public sector-led, private sector-led and/or mixed) and between TIs and other actors beyond the community of environmentalists (see Table 4).

Partnering occurred in a great variety of ways ranging from informal to formal ties and varying in temporal, intentional and organizational dimensions. TIs cooperated briefly or formed long-term ties. They cooperated within as well as across city-regions, either deliberately or incidentally. They did so for both pragmatic and value-oriented reasons.

We find that TIs partnered more often with other TIs within the same domain than they did across domains. They also collaborated more often within their own sector—being either civil society, the public sector, or the private sector—than they did across sectors. Partnering across sectors proved to be a particular challenge because actors from the public sector, the private sector and civil society literally “speak different languages”. They operate in different spheres—quite often isolated from each other—follow different normative conceptions of how state and society should function or pursue different (and possibly conflicting) interests. This confronts TIs with a problem of translation, requiring actors to reconcile diverse worldviews and interests. Hence, partnering across sectors is accompanied by more tensions than partnering within sectors.

Against this backdrop, mediators, translators, and networkers played a key role in enabling partnering between public authorities, private businesses, and civil society. Some initiatives even started to focus on being such mediators and translators and formed networking TIs. However, if short-termism and loose partnering was predominant in a city-region, the reliance on individual mediators also created fragility and vulnerability. Collaboration then heavily depended on the commitment of this small circle of actors and lacked wider backing by society.

In a situation where TIs have only limited resources at their disposal, especially time, partnering can lead to a tension between building partnerships and the “core activities” of the TIs. TIs found that their core purpose and their core practices could suffer if partnering with others was too demanding. In a similar vein, partnering led to imbalances between TIs, where one TI benefitted more from the synergies generated than the other TI did, or one TI invested more resources to create these synergies than the other TI did. Therefore, TIs were very careful and sometimes even wary of engaging in partnering. Limited resources being available to TIs also created conflicts and rivalry between them, especially when competing for external funding. This in turn hampered their efforts of building partnerships.

Partnering generated various synergies that can be described as resource synergies, governance and institutional synergies, and/or social synergies. It allowed TIs to improve their legitimacy and credibility, to generate new governance models or to explore new urban value chains. In particular, the collaboration across sectors has been an important entry point for embedding. Political alliance-building between TIs can give them a stronger voice vis-à-vis public authorities and the business community (i.e., governance synergies). It can further consensus-building between different stakeholders and, by doing so, pave the way for embedding.

#### (b) Differences

While the similarities across the city-regions prevail, the dynamics of partnering slightly differ in the city-region of Stockholm (see Table 4). This is related to the multi-level structure within Stockholm with the city-region and the 26 municipalities as two separate governance levels. Therefore, TIs cooperated not only horizontally with other TIs within or between the municipalities, but also vertically with TIs operating in the entire city-region.

**Table 4.** Partnering.

The Pooling and/or Complementing of Resources, Competences and Capacities of TIs in order to Exploit Synergies	
Commonalities	
Finding:	
Partnering based on pragmatic and / or value-oriented reasons	
Examples:	
Genk:	
<ul style="list-style-type: none"> <li>Heempark and Natuurpunt: These initiatives that are aligned ideologically cooperate to publish a joint magazine, combining resources and capacities.</li> </ul>	
Finding:	
The importance of mediators, translators and networkers in building partnerships	
Examples:	
Budapest:	
<ul style="list-style-type: none"> <li>Magnet Bank: The new bank with a community-oriented approach has utilized its centrally located headquarters as a host site for programs, workshops and open events. These showcase the work of the civil service initiatives it provides banking services to.</li> </ul>	

Table 4. Cont.

The Pooling and/or Complementing of Resources, Competences and Capacities of TIs in order to Exploit Synergies	
<b>Commonalities</b>	
Finding: The tension between building partnerships and the “core activities” of the TIs	
Examples: Budapest:	
<ul style="list-style-type: none"> <li>Multiple TIs: the overall perspective of TIs in Budapest presents a cautious approach to partnering with municipal authorities. This is due to a lack of fluid communication mechanisms, transparency and previous experiences which left the initiatives feeling utilized for the purposes of positive publicity rather than cooperation.</li> </ul>	
Finding: Partnering as providing an entry point to embedding	
Examples: Genk:	
<ul style="list-style-type: none"> <li>Bee Plan: Initiated by a spontaneous civilian brainstorm during an open meeting of the Environmental Council, the Bee Plan was immediately supported by the City. The City set up a horizontal, encompassing strategy, covering multiple city departments and sectors (the local catering industry and the bee keepers association). With the approval by the City Bench of Aldermen, special funds were allocated to the plan and a Bee-team established.</li> </ul>	
<b>Differences</b>	
<b>Brighton, Budapest, Dresden, and Genk</b>	<b>Stockholm</b>
TIs partnering horizontally with other TIs within the city-region	Due to the decentralized unitary state, 26 highly autonomous municipalities exist within the city-region of Stockholm. Therefore, TIs partnered not only horizontally with TIs in other municipalities, but also vertically with TIs being engaged in the entire city-region.

#### 4.4. Instrumentalizing

##### (a) Commonalities

Across the city-regions, empirical evidence shows that many TIs were able to mobilize resources to advance sustainability locally (see Table 5). In doing so, they have drawn on multiple sources of external support. These have been resources such as finances, but also the provision of advice and guidance, or the provision of institutional and physical “free spaces” for experimenting with sustainability solutions. Awards designed to acknowledge the voluntary commitment of TIs give them public recognition and enhance their legitimacy.

Instrumentalizing depends considerably on the TIs’ own fund-raising abilities. Hence, many TIs have gone through learning processes and professionalized their fund-raising activities over time. This also entailed learning on how to navigate their respective national governance contexts and if possible and/ or necessary draw on foreign sources of funding. The ability to develop these funding raising capacities proved to be a core skill for TIs. It often made a difference between a lasting TI and one that burns out in the short- or mid-term. By increasing the resource base of TIs, instrumentalizing also enabled TIs to expand their activities. This helped TIs with both upscaling and partnering.

The trend of a “projectification” of funding [55] has been reinforced by governments’ focus on cost optimization and effectiveness. This has created institutional conditions in which it is much easier to obtain short-term, project-based funding than long-term funding that would sustain the TIs. It has created high uncertainty and insecurity for the TIs and caused individuals to withdraw from them. In some cases, this has even threatened the existence of the TIs. In addition to dealing with the uncertainty of project-by-project operations, organizations that received stable funding support of



foreign origin have also faced closer scrutiny of their finances by the local government. Consequently, such instability of funding impedes action on sustainability and protracts urban transitions.

In a similar vein, instrumentalizing created a tension between the dependence on external sources on the one hand and the autonomy of the TIs on the other hand. By doing so, it points to a two-way interaction between TIs and external donors. TIs instrumentalize external donors while external donors might also instrumentalize TIs for their own purposes [56,57]. The “provisioning and nurturing” of TIs can create leverage for external donors, who might be governments or businesses. It gives them the opportunity to present themselves as socially- and ecologically-responsible, and/or as open and responsive towards citizens. Therefore, when drawing on external funding, TIs have at times struggled with preserving their core values or core mission.

Against this backdrop, TIs have grown more critical on whom they should accept or reject as a donor. Some TIs prefer to be self-sustaining to protect their autonomy, for instance by drawing on funding from their members and supporters via membership fees.

#### (b) Differences

Empirical evidence illustrates that the modes and practices of instrumentalizing are shaped by specific national governance contexts (see Table 5). These national governance contexts vary considerably between the city-regions. The city-regions under study encompass unitary states such as the UK, Sweden and Hungary and federal states such as Germany and Belgium. Moreover, within the group of unitary and federal states, they represent different types. For unitary states, the UK is a centralized unitary state with low local autonomy, while Sweden and Hungary are decentralized unitary states with high local autonomy. For federal states, the “cooperative federalism” of Germany contrasts with the “dual federalism” of Belgium.

The unitary political systems with power concentration on one governance level—either the central government or the municipalities—create a higher dependence of TIs on this single level of governance. By contrast, federal political systems with the dispersion of political power provide TIs more leeway to respond to the opportunities and obstacles provided by governance settings [58].

In unitary states, the centralized unitary state of the UK with low local autonomy has led to a “nationalization” of the perspectives and activities of TIs. Conversely, the decentralized unitary state of Sweden with high local autonomy has led to a “localization” of the same. In light of the low support of the Hungarian central government for community initiatives, TIs in Budapest oriented their fundraising activities towards foreign donors.

In federal states, the “cooperative federalism” of Germany and the “dual federalism” of Belgium combine centralization with decentralization and, by doing so, afford high autonomy to the municipalities. This has resulted in a “multi-levelization” of the perspectives and activities of TIs, whereby they seek to tap into opportunities provided by the multiple levels of the governance context in order to gain support and financial resources.

**Table 5.** Instrumentalizing.

The Tapping into and Capitalizing on Opportunities Provided by the Multi-Level Governance Context and the Urban Governance Patterns of the City-region in order to Obtain Resources	
Commonalities	
Finding:	TIs drawn on multiple sources of external support
Examples:	
Genk:	
	<ul style="list-style-type: none"> <li>Re-use Centre De Koop: The center tapped into the regional trend of waste reduction early on. This allowed the center to raise funds from multiple sources such as the Flemish government, Limburg.net or EU funding schemes.</li> </ul>

Table 5. Cont.

The Tapping into and Capitalizing on Opportunities Provided by the Multi-Level Governance Context and the Urban Governance Patterns of the City-region in order to Obtain Resources				
<b>Commonalities</b>				
Finding: By increasing the resource base of TIs, instrumentalizing enables upscaling and partnering Examples: Genk:				
<ul style="list-style-type: none"> <li>Heempark: Overwhelmed by the growing number of visitors, the volunteers managed to get public support by establishing the City's Environment and Nature Centre at the Heempark. This newly established public-civic partnership succeeded in attracting more volunteers and visitors to the Heempark.</li> </ul>				
Finding: The "projectification" of funding Examples: Budapest:				
<ul style="list-style-type: none"> <li>Multiple TIs: The TIs have shown signs of organizational burn-out. This resulted from the necessity to survive on a project to project basis, and its impact on core participants who serve as hybrid employee-volunteers to keep the activity of the initiative moving forward.</li> </ul>				
Finding: The tension between the dependence on external sources and the autonomy of TIs Examples: Brighton:				
<ul style="list-style-type: none"> <li>Brighton Energy Cooperative: The cooperative utilized national government funding to conduct energy efficiency surveys merely to survive as an organization rather than pursue its primary purpose of renewable energy technology deployment.</li> </ul>				
<b>Differences</b>				
<b>Brighton</b> A centralized unitary state: a "nationalization" of the perspectives and activities of TIs	<b>Budapest</b> A decentralized unitary state: in light of low domestic support for community initiatives, an orientation towards foreign sources of funding	<b>Dresden</b> "Cooperative federalism": a "multi-levelization" of the perspectives and activities of TIs	<b>Genk</b> "Dual federalism": a "multi-levelisation" of the perspectives and activities of TIs	<b>Stockholm</b> A decentralized unitary state: a "localization" of the perspectives and activities of TIs

#### 4.5. Embedding

##### (a) Commonalities

Embedding was observed in multiple forms: (1) embedding new ways of doing (i.e., practice), (2) embedding new ways of thinking (i.e., culture) and (3) embedding new ways of organizing (i.e., structure). Embedding occurred via the routinization and institutionalization of sustainable alternatives. The dynamics of embedding encompassed governmental institutions, economic enterprises, as well as community initiatives. This corresponds with a wide conception of governance that includes state as well as non-state actors (see Table 6).

Embedding evolved out of collaboration or confrontation. Where TIs created attractive alternatives that offered new solutions to the problems of local governments, state actors aligned their activities with them based on collaboration. By contrast, where TIs challenged the stakes and interests of incumbent actors, embedding had to be fought for by way of confrontation and contestation. Accordingly, embedding proved to be easier if both TIs and incumbents perceived a synergy between the objectives

and the activities they pursued. This might be a resource synergy, a governance and institutional synergy, and/or a social synergy [23].

In a similar vein, larger TIs can have stabilizing effects on smaller TIs. By providing synergies for them, they can lead to processes of co-evolution, where the small TIs co-evolve with the large TIs. For instance, local food cooperatives can stabilize regional organic farmers by creating stable demand for the supply of organic food.

The motivations behind embedding have highly differed. While for some TIs, embedding is a vital part of their activities, for others, embedding is not a mission at all. They understand themselves more as passionate practitioners and much less as political activists, aiming for political change. Some TIs are even reluctant to address state actors and institutions because they retain skepticism towards political parties and public administrations.

As it is intended to align new ways of DTO with established ways of DTO, the process of embedding is imbued with problems of translation and trust-building between the public sector, the private sector, and civil society. Each of these actors “speak different languages” and follow different logics of DTO. Against this backdrop, the formalization of TIs by creating a legal entity to represent themselves was important for them to be acknowledged by public authorities.

The stabilization of sustainable ways of DTO can come with the drawback of a routinization and a loss of creativity. On the one hand, if TIs succeed in “stretching-and-transforming” [14,59]; the existing ways of DTO, they can change city-regional governance patterns and accelerate urban sustainability transitions.

On the other hand, if TIs have to do with “fitting-and-conforming” [14,59], their innovative potential might wither away. For instance, the embedding of TIs in the routines of public institutions might run the risk of turning towards traditional policy implementation and of compromising the creativity and empowerment of citizens. This also entails the risk of silencing critical voices and absorbing change makers into the established, un-sustainable patterns of city-regional governance (cf. [60–63]). Therefore, civil society-led TIs are skeptical of engaging in political lobbying and/or cooperating with public authorities because they fear being taken over by politics.

In light of these tensions, embedding points to the “politics of sustainability transitions” [64,65]. These entail struggles over political leadership and ownership between the incumbents and the TIs as their challengers (see for example [66–68]).

## (b) Differences

In comparing the dynamics of embedding within the city-regions, the pro-active role of the local government of Genk comes to the fore. While all local governments are confronted with similar challenges of the compartmentalization of local public administrations and the translation and mediation between different types of actors, the government of Genk seeks to tackle these in a pro-active manner (see Table 6).

The compartmentalization of local public administrations is described as a severe obstacle across the city-regions. On the one hand, specialization comes with the strength of in-depth knowledge and expertise. However, on the other hand, it comes with the weakness of public officials following “selective perspectives” [69] and “silo politics” [70]. They struggle to move beyond organizational boundaries and develop a more integrative, holistic perspective on sustainability. This can create a situation of insecurity and unclear mandates.

Different from the other city-regions, the government of Genk seeks to overcome this type of sectoral thinking and promote a more integrative understanding of sustainability. It seeks to change both the ways of organizing (structure) and thinking (culture) in the public administration. Thus, it is currently re-designing the administrative structures in a more horizontal manner and tries to encourage its staff to develop more open-minded and flexible leadership skills to overcome institutional barriers to novelties.

Similar to partnering, embedding underlines the importance of mediators to tackle the problem of translation because by “speak[ing] the language of the public administration” (Interview DD 25), they can bridge differences between actors from the public sector, the private sector and civil society. However, the role of mediators in embedding comes with chances as well as risks. While on the one hand, these mediators facilitate embedding, on the other hand the reliance on these few actors makes the transition process very fragile and vulnerable. Embedding might be reversed if these individuals become overburdened by their voluntary commitment or leave the city-region. Moreover, the strong engagement of these mediators might turn into a fallacy if they start to defend their own ideas and solutions and stop listening to others.

The comparison of the city-regions shows that these mediators, networkers, and translators mostly stem from civil society with the exception of Genk. Here, the local government itself tries to act as a translator. Local authorities promote networking via a team of district managers who work alongside community development teams to facilitate networking within the city districts. More importantly, these teams have been crucial for changing the identity of the local government from a “servicing” to an “empowering” city, i.e., from one that serves citizens to one that empowers them to participate in community development.

**Table 6.** Embedding.

<b>The Tapping into and Capitalizing on Opportunities Provided by the Multi-Level Governance Context and the Urban Governance Patterns of the City-region in order to Obtain Resources</b>	
<b>Commonalities</b>	
Finding:	
Embedding occurred in multiple forms	
Examples:	
Stockholm:	
<ul style="list-style-type: none"> <li>Rösjö Green Wedge Collaboration: The collaboration was established gradually with common objectives being defined by the municipalities in the city-region and annual working plans with an allocated budget being developed. It even succeeded in having the green wedge collaboration included in the official work profile of the civil servants. This proved to be a major stabilizing factor.</li> </ul>	
Finding:	
Synergies between the objectives of the incumbents and the engagement of TIs as facilitating embedding	
Examples:	
Genk:	
<ul style="list-style-type: none"> <li>Local government: The recent severe economic crisis in Genk paved the way for more sustainable ways of DTO to emerge. The city government realized that a business-as-usual approach is insufficient to regenerate the city and began actively exploring new and more sustainable concepts such as a circular economy or citizen budgeting. Next to already being quite progressive in pioneering social innovation, this contributes to the creation of an enabling environment for the embedding of more sustainable alternatives.</li> </ul>	
Finding:	
Processes of co-evolution between larger and smaller TIs	
Examples:	
Dresden:	
<ul style="list-style-type: none"> <li>Organic food cooperative (VG): The cooperative triggered a co-evolution process of organic agriculture surrounding the city-region since the early 1990s. By stabilizing demand for organic produce and reducing the economic risks of a transition, it could encourage local farmers to shift from conventional to organic farming.</li> </ul>	

Table 6. Cont.

The Tapping into and Capitalizing on Opportunities Provided by the Multi-Level Governance Context and the Urban Governance Patterns of the City-region in order to Obtain Resources	
<b>Commonalities</b>	
Finding: The tension between the stabilization of innovative ways of DTO and routinization and a loss of creativity	
Examples:	
Genk:	
<ul style="list-style-type: none"> <li>• Bee Plan: Although the Bee Plan was started as a multi-actor initiative, it was transformed into a conventional policy implementation approach when it was taken up by the local government.</li> </ul>	
Finding: The silencing of critical voices and absorbing change agents into the incumbent routines of unsustainability	
Examples:	
Stockholm:	
<ul style="list-style-type: none"> <li>• Municipal Collaboration of Stockholm Green Wedges (KR) and the Rösjö Green Wedge Collaboration (KS): Politicians participating in the collaboration expected political backing from the environmental NGOs. However, these environmental NGOs still sought to preserve their political autonomy and to build up opposition against other municipal activities.</li> </ul>	
<b>Differences</b>	
<b>Brighton, Budapest, Dresden, and Stockholm</b>	<b>Genk</b>
A passive approach towards the compartmentalization of local public administrations and the translation and mediation between different types of actors	A pro-active approach towards the compartmentalization of local public administrations and the translation and mediation between different types of actors

## 5. Discussion

With our comparative case study, we seek to offer comparative insights on urban sustainability transitions because city-regions as sites of transitions towards sustainability have remained under-explored so far [71–75]. We also seek to fill a research gap on the acceleration phase of sustainability transitions (e.g., [13,14,76]). We explore how transitions can move beyond the seeding of alternative experiments and the activation of community initiatives in five diverse city-regions. We discuss the empirical findings yielded from this comparison in the following.

### 5.1. Similar Dynamics of the Acceleration Mechanisms versus Different Governance Settings

We found evidence of all five mechanisms of acceleration in the city-regions under study. TIs are in various degrees increasing their outreach (Cargonomia, a cargo bike initiative in Budapest, spreading across the city districts), adopting and replicating sustainable solutions locally (Transition Town Dresden), strengthening connections (the Brighton and Hove Food Partnership), mobilizing resources, legitimacy and support (the Heempark in Genk as a civic-public partnership), spreading sustainable alternatives to the wider public (the Dresden food cooperative with approximately 10,500 members in 2017) and changing practices and routines (the Bee Plan in Genk).

As our findings illustrate, the acceleration mechanisms also reinforced each other. By raising the visibility and recognition of TIs by (local) political actors, upscaling helped to pave the way for embedding. This was supported by instrumentalizing as it broadened the resources base of TIs, enabling them to expand the scope of their activities. This helped TIs with both upscaling and partnering. Replicating contributed to embedding by allowing local TIs to learn lessons from other TIs. Hence, they would not have to “re-invent the wheel”, but could build on the experiences of others. In a similar vein, partnering across sectors improved the legitimacy and credibility of TIs, helping them to generate new governance models or to explore new urban value chains. The political alliance-building

between TIs could give them a stronger voice vis-à-vis public authorities and the business community. This suggests that the relationships between the mechanisms are manifold and complex.

However, our empirical findings also shed a more critical light on the acceleration mechanisms, challenging an overly affirmative view proposed by the previous literature (e.g., [2,21,27,29,31,33]). Against this background it is a remarkable finding that, across all the city-regions, similar tensions arose as the acceleration mechanisms unfolded.

Upscaling was confronted with the tension of the limits of growth. While replicating other TIs was a vital source of inspiration, it required the contextualization of the TIs to be attuned to local conditions. Partnering was accompanied by the tension between cooperation and the preservation of the core values of the TIs. This held especially if the TIs partnering spoke different languages and represented different world views. Partnering could lead to imbalances in the relationship between the TIs, especially if the burden of cooperation was distributed unequally among the partners. Instrumentalizing created a tension between the reliance on external resources and the protection of the autonomy of the TIs as it provided political leverage for donors to influence the TIs. Such capture of TIs by external donors can undermine their core values [56,57]. Embedding can develop a dynamic of “stretch-and-transform” or “fit-and-conform” [14,77]. While the former can fundamentally transform entrenched, unsustainable ways of DTO, the latter can diminish the innovative potential of TIs. It can rather be turned into a traditional policy implementation approach.

These tensions suggest that more is not automatically better. What matters is the quality of how an acceleration mechanism evolves. Therefore, we propose a more nuanced understanding of these mechanisms of acceleration, entailing not only chances, but also challenges.

Embedding was found to be a core mechanism for the acceleration of sustainability transitions because it links new ways of DTO with traditional ones. In all city-regions, mediators and translators were important facilitators of embedding as they helped to bridge the differences between the public sector, the private sector and civil society. However, at times, the embedding into institutional frameworks proved to be of rather transitory nature. Changes in legal frameworks or governance structures could also be reversed or abolished, restoring the status quo ante. In light of the fragile nature of transformative action, we propose to extend the conceptual framework of acceleration mechanisms by introducing another mechanism: diversifying. The diversification of TIs by establishing multiple TIs with their own specific profile in the city-regions allows them to seek both multiple entry points and anchor points for sustainable ways of DTO. If they find themselves discouraged in one setting or do not speak towards particular actors, another TI can potentially step in and compensate. By doing so, diversifying increases resilience and helps to sustain the dynamics of urban transitions towards sustainability.

While we found these commonalities among the tensions created by the acceleration mechanisms, we observed differences between the governance settings of the city-regions. Distinct opportunities and obstacles arose from the differences between the multi-level governance contexts and the local governance patterns. In particular, the modes and practices of instrumentalizing were shaped by the diverse national governance contexts.

In the context of the centralized unitary state of the UK, the central government holds the power of the purse. The spending cuts in the wake of austerity politics curtailed the activities of TIs considerably and even undermined the efforts of a green-led city council (2010–2015) to promote sustainability. In Hungary, the lack of resources and support from both the central government and the local government of Budapest hindered community initiatives in their pursuit of sustainability. In Dresden, Germany, the conservativeness and insufficient political support by previous city councils proved to be an obstacle for TIs. This was partly counter-balanced by the context of a federal state because community initiatives could circumvent the local government by appealing to other governance levels. Quite distinct from the other city-regions, Stockholm is characterized by a pronounced multi-levelness as the decentralized unitary state of Sweden grants considerable local autonomy to the 26 municipalities



within the city-region. Thus, the conditions for TIs differed between the municipalities with some endorsing sustainability and others disregarding it.

The local government of Genk, Belgium, stood out from the other city-regions because it was open to change and mobilized resources to further sustainable development locally [6]. It itself adopted the role of a translator between local stakeholders. In so doing, it could build on a tradition of pioneering social innovation and a well-organized network of district managers and district budgets in the city-region.

These varying conditions between the city-regions demonstrate that political backing is not a necessary condition for TIs to drive. They also took initiative of their own. However, if it was provided, it was of substantial support.

### 5.2. From Linear Models to Complex Cascades

The multi-phase model suggests that sustainability transitions follow a linear process with clear demarcations between the phases (e.g., [11–14,78,79]. Our empirical findings contradict this view and support perspectives that emphasize the non-linearity and messiness of transition processes [80]. They show that there are no clear demarcations between the phases of transitions. Studying sustainability transitions from the perspective of city-regions, we find dynamics of acceleration, deceleration and stagnation with different time frames and geographical coverage to unfold in parallel. We observed several transitions—transitions towards both sustainability and un-sustainability—to co-evolve. This implies that sustainability transitions should be re-conceptualized as heterogeneous processes with multiple dynamics of acceleration, deceleration, and stagnation, varying over time, space, and domains within the city-regions. This also suggests that the inertia, path dependencies and drivers of un-sustainability should be considered to better capture the dynamics of urban sustainability transitions. These can be coined the politics of persistence (e.g., [65,67].

### 5.3. The Boundaries of the Research Design

The comparative design of this explorative study of urban sustainability transitions compares five city-regions at the same point in time while transitions are long-term processes, stretching over several decades or possibly generations. Thus, our findings are rather exploratory than explanatory. Our findings also have to be interpreted in light of the selection criteria for the TIs defined by our conceptual framework. They were defined as forms of collective agency, locally-based initiatives, and novel within their local settings. Comparing the TIs across domains, the focus on the local community pertains especially to the food domain. Consequently, our finding of very vibrant dynamics of change in the food domain—more so than in the other domains—might reflect this selection bias. In the case of Budapest, research results have to be interpreted as strongly linked to the third sector, since no public and only two private driven TIs were included in our analysis.

## 6. Conclusions

With our comparative case study and analysis, we contribute to the scholarship on sustainability transitions by exploring the dynamics of acceleration in depth. By doing so, we developed a refined conceptualization of the acceleration phase that underlines the heterogeneous and opposing dynamics of sustainability transitions. They are characterized by multiple dynamics of acceleration, deceleration, and stagnation. This illustrates the complex and precarious nature of processes of transformative change and underlines the importance of sustained support for TIs to uphold their efforts and stabilize new ways of DTO.

By exploring the dynamics of urban sustainability transitions in five European city-regions, we also filled a research gap on sustainability transitions at the urban level. With this comparative perspective, covering city-regions from diverse national governance settings (ranging from centralized unitary states, decentralized unitary states, cooperative federalism to dual federalism), we elaborated the similarities and differences in the manner the acceleration mechanisms unfold. The most striking

finding is that across all five city-regions the acceleration mechanisms are confronted with similar tensions. Last but not least, by adopting an agency perspective, we moved beyond a systemic conception of change. We rather showed how change is enacted by local TIs as collective actors and how they shape new relations as well as new and existing institutions. By doing so, we elucidate the micro-foundations of sustainability transitions as deeply social processes.

Acknowledging the long-term nature of sustainability transitions, future research could adopt a longitudinal perspective on the study of urban sustainability transitions. It could explore the development of dynamics of acceleration, deceleration, and stagnation over time. This could yield new insights on the gradual, evolutionary processes of transformative change.

In studying the urban level, future research could explore the “geographies of transitions” [81–84]. It could address the question of how space matters in urban sustainability transitions. This entails the contested nature of space in continuing processes of urbanization. It could illustrate the role of space in cultivating sustainable or un-sustainable ways of DTO.

While we studied the role of TIs in fostering urban sustainability transitions, future research could analyze the internal dynamics of TIs more in depth. It could examine the conflicts between sustainable and un-sustainable ways of DTO the TIs experience in their daily practices and endeavors.

In order to account for diverse governance settings, future research could situate urban sustainability transitions in the context of multi-level governance [53,82,85]. It could analyze how urban governance patterns as well as governance contexts (i.e., EU politics, transnational networks, national and sub-national politics) influence the dynamics of urban change.

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## Abbreviations

TIs	Transition initiatives
DTO	Doing (practices), thinking (narratives, imaginaries) and organizing (structure)
UNESCO	United Nations Educational, Scientific and Cultural Organisation
EU	European Union
GDR	German Democratic Republic
ICLEI	International Council for Local Environmental Initiatives—Local Governments for Sustainability
NGO	Non-governmental organization
UK	United Kingdom
VG	Organic food cooperative in the City of Dresden
KR	Municipal Collaboration of Stockholm Green Wedges
KS	Rösjö Green Wedge Collaboration

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